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The Hardy Orchid Society

Our aim is to promote interest in the study of Native European Orchids and those from similar temperate climates throughout the world. We cover such varied aspects as field study, cultivation and propagation, photography, taxonomy and systematics, and practical conservation. We welcome articles relating to any of these subjects, which will be considered for publication by the editorial committee. Please send your submissions to the Editor, and please structure your text according to the "Advice to Authors" (see website **www.hardyorchidsociety.org.uk**, January 2004 Journal, Members' Handbook or contact the Editor). Views expressed in journal articles are those of their author(s) and may not reflect those of HOS.

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Front Cover Photograph

Early-purple Orchid (*Orchis mascula*) amongst soft focussed Bluebells by Mike Gasson. See article about pollination on page 65.

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Editorial Note

This *JHOS* has a major article on identification guides from Richard Bateman and my own piece on *Orchis mascula* pollination. The latter is timed to coincide with the first orchids in the new season and includes a suggestion for HOS members to check out their local populations. There are more winners' photographs from the 2012 Photographic Show plus details of Rule and Class changes for 2013. We have two new book reviews and as well as a critique; Paul Harcourt Davies has included an insightful discussion about taxonomic philosophy. We still need more articles for future issues of *JHOS* so do consider sending in reports from your trips and observations! Articles do not have to be long and relatively short pieces of 2 to 5 pages are especially useful when building the contents for an issue.

Chairman's Note

Celia Wright

Hello everyone! I write this on a cold March day with snow falling outside. I hope the weather will be better by the time we are all taking our plants to the Plant Competition and AGM at Kidlington on April 21st. The programme looks excellent with Svante Malmgren as our overseas guest speaker. If you've lost your application form, you can print another one from the website. Do put the dates for the autumn meetings in your diaries now – Saturday 7th September for Leeds and Sunday 17th November for Kidlington again. Application forms will be enclosed with the July Journal.

In committee we have agreed some changes to our Photographic Competition arrangements. There will be a new class for prints (maximum size A4) for a hardy orchid subject that has been manipulated creatively, using any advanced software techniques to create an artistic image. We were inspired to introduce this class after seeing some of the photos in a similar class from the Alpine Garden Society competition. An example will be included in the July *JHOS*. Changes to the Rules for the competition have also been introduced to make administration easier. The altered version is on page 41 and also on the website. Please read this carefully if you plan to enter. The closing dates for entries this year are expected to be October 14th for digital entries and November 4th for notifications of print entries and postal entries of prints. These dates will be confirmed in the July Journal and on the website.

At the AGM, I will be introducing our new Conservation Champions and telling you who is on the list so far. These are HOS members who have volunteered to be local conservation contacts for the Society. After that, the list will be made available on the website and I hope to have a short article in the July Journal. If this might interest you, please let me and Bill Temple know.

I have written in the Journal twice this year of my concerns about filling committee vacancies. I remain concerned that we do not currently have a Vice Chairman and no-one has expressed an interest in other roles that will fall vacant soon. Once again, please consider whether you can help and talk to me about it. My best wishes to you all.

Additional Field Trip

Thursday 20th June 2013: Kent, to see *Ophrys fuciflora*, *Ophrys apifera*, *Orchis anthropophora*, *Anacamptis pyramidalis*, *Himantoglossum hircinum*, *Dactylorhiza praetermissa* (including var. *pardalina*) and *Gymnadenia conopsea*.
To book, contact Field Trip Leader Alan Blackman ALANOphrys@aol.com

Changes to Photographic Show Rules and Classes

The complete set of Rules is reproduced below with changed rules shown in blue type:

1. Judging will be based on the quality of the pictures, not on the rarity of the plants.

2. Plants may be wild or cultivated, though only ‘hardy’ plants are acceptable.

3. Members must inform the Show Manager in advance of the number of entries they will bring.

4. Each member may enter one picture only in each Class.

5. Pictures entered previously in HOS competitions are not permitted.

6. The name of the member entering a print must appear on the back only.

7. Each print must be accompanied by a small title note naming the plant and providing any information of interest to members. The print must be unmounted and placed in a plastic sleeve; it is the responsibility of the member entering the photograph to supply the plastic sleeve. The title note must either be in the sleeve with the print or stuck firmly on the outside of the plastic sleeve so that it is clearly visible when the print is displayed. The sleeve is essential for protection while on display and to ensure that the title and the photograph are not separated – entries without it will not be accepted. This applies to prints brought to the Show and those posted to the Photographic Competition Organiser in advance. Sleeves will not be supplied by the Organiser for postal entries or at the show. Notification of entries must be sent to the Organiser. Contact details of the Organiser and deadline dates for entry will be notified well in advance in the Journal and on the website. For entrants who cannot come to the meeting, the Organiser will accept postal entries (prints) by the deadline date. Prints cannot be returned by post. Members can collect their prints at end of the meeting or arrange for someone else to do this for them. The Organiser will bring all uncollected prints to subsequent meetings up to and including the meeting when the next year’s Photographic Competition is held. Members may collect them from the Organiser at any of these meetings.”

8. When a class states ‘close-up’, the photograph should include only part of a plant. This would normally be the flowering part, but may be another detail of interest.

9. When a class states ‘a single orchid plant’, the picture should consist of the whole of a single plant which may be multi-stemmed.

10. For Class 13, a Novice is defined as an HOS Member who has never been placed First in an HOS Photographic Competition.

11. Images printed digitally may have minor adjustments to improve print quality and limited manipulation to remove distracting items.
12. For classes 9 to 12 the images should be put on a CD and posted to the appropriate person with your name, contact details, a list of image titles and the classes they are entered in and a note naming the plant and providing any other information of interest to other members. None of this information should appear on the images themselves. Single images may be e-mailed.
13. All entries in any class should be of orchids photographed within two years of the competition.

An additional new Class has been added:

Class 14: A hardy orchid subject that has been manipulated creatively using any advanced software technique to create an artistic image. Print maximum size A4.

More Photographic Show Winners from 2012

The following pages have more winning photographs from the 2012 Photographic Show. Numbers indicate the Class followed by the place achieved e.g. 1-2 is the second placed winner in Class 1:

Class 1 second: Tom Turner - *Orchis mascula* (photo 1-2)
Class 2 second: David Pearce - *Anacamptis morio* (photo 2-2)
Class 3 second: Ruth Brown - *Dactylorhiza sambucina* (photo 3-2)
Class 3 third: Richard Jones - *Ophrys speculum* (photo 3-3)
Class 4 second: Nigel Johnson - *Goodyera repens* (photo 4-2)
Class 5 first: Tony Hughes - *Dactylorhiza fuchsii* & *D. praetermissa* (photo 5-1)
Class 5 second: Tom Turner - *Orchis mascula* (photo 5-2)
Class 6 second: Alan Pearson - *Orchis anthropophora* (photo 6-2)
Class 7 second: Ron Harrison - *Dactylorhiza maculata* (photo 7-2)
Class 8 second: Tony Hughes - *Orchis olbiensis* (photo 8-2)
Class 1 third: Nigel Johnson - *Orchis quadripunctata* (photo 8-3)
Class 9 first: Patrick Marks - *Himantoglossum robertianum* (photo 9-1)
Class 9 second: Eric Gendle - Group of several orchid species (photo 9-2)
Class 9 third: Ruth Brown - *Orchis mascula* (photo 9-3)
Class 10 second: Mike Waller - *Hammarbya paludosa* (photo 10-2)
Class 10 third: Patrick Marks - *Dactylorhiza incarnata* (photo 10-3)
Class 11 second: Mike Waller - *Neottia cordata* (photo 11-2)
Class 12 second: Eric Gendle - *Ophrys insectifera* (photo 12-2)
Class 13 first: Alan Pearson - *Serapias cordigera* (photo 13-1)
Class 13 second: Steve Pickersgill - *Ophrys fuciflora* (photo 13-2)


6-2


2-2


10-2


9-3


11-2


7-2


3-3


3-2

8-2

12-2

4-2

13-1

13-2

1-2

1O-3

8-3


9-1


5-1


5-2


9-2

Why Identification Guides Don't Always Work

Richard Bateman

Enthusiasts of European orchids are fortunate to have been provided with a wide range of specialist books, many of them excellent in comparison with those available to aficionados of less obviously charismatic plant families. Certainly, most issues of *JHOS* include at least one review of a new book on European orchids.

The majority of those books are orchid floras of a particular European country. For many years, the UK led the way with Summerhayes' (1951 *et seq*.) well-informed tome, but in recent years some spectacular volumes have emerged from mainland Europe; examples include the accounts of the orchids of the Netherlands by Kreutz & Dekker (2000) and of France by Bournérias & Prat (2005). We have also witnessed an increasing number of floras covering just one part of a European country, such as the detailed account of the Italian subalpine province of Bergamo by Ferlinghetti *et al.* (2001). A few volumes, most notably the much-carried field flora of Delforge (2006), cover the whole of Europe and perhaps Asia Minor, albeit providing less detail per species. And we are also occasionally provided with a treatment that is taxonomically rather than geographically constrained, such as the monographs of the former genus *Orchis* by Kretzschmar *et al*. (2006) and of *Ophrys* by Pedersen & Faurholdt (2007).

Even a brief survey of the better examples of such books makes clear that the aesthetics of design, and the quality of reproduction of colour images, have advanced by leaps and bounds in recent years. And yet, when visiting the country in question and facing an 'unknown' orchid in the flesh, we can still be thrown into paroxysms of uncertainty regarding the orchid's identity. Just why don't floras and monographs always work? Or, to couch this question more positively, could the content and presentation typical of such works be further improved, and if so, how?

Information content of a flora

If we disassemble a flora or monograph, what is it likely to contain? Obviously, each entry begins with a Linnean binomial, often accompanied by one or more vernacular names. Beneath are often listed some of the more frequently used Linnean synonyms. At the core of each species treatment is a formal written description, designed to provide the reader with a rounded impression of its morphology. Its typical chromosome number, flowering period, habitat preference and geographic distribution are also likely to be given, the distribution often being presented as some kind of map. Moreover, the written descriptions are usually supported by some form of illustration of one or more plants.

Of course, the species descriptions must be placed in linear sequence within the guide. This is most commonly dictated by following one of the many prior genus- and species-level classifications. All too often the chosen classification relies on crude estimates of morphological similarity, which is assumed to reflect closeness of relationship, but fortunately there is an increasing chance that the classification will reflect scientifically demonstrated evolutionary relationships. Alternatively, and in direct philosophical contrast, the genera and/or species are simply placed in alphabetical order. Having been described, the species are then typically compared by abstracting from the formal descriptions small numbers of characters that are considered especially informative and summarising those prioritised characters as some form of identification key, most commonly using dichotomous couplets. So far, this approach sounds suitably organised and rational. So where do the weaknesses lie?

Written descriptions

Let us consider each of these components in turn, beginning with the vital core element – the formal description. Most characters are typically described qualitatively rather than quantitatively, which often leads to several different forms of ambiguity. Firstly, the descriptor can be insufficiently precise. For example, the labella of many European orchids, such as the anthropomorphic *Orchis* species, are often described as being “four lobed”. But this simple description fails to note that the lobing is hierarchical; the labella are fundamentally three-lobed, but the central lobe develops a median notch that effectively bisects it to render it bilobed. Indeed, you could argue that many such labella are five-lobed, given that a small tooth often forms within the notch of the central lobe. More detailed explanation is needed than simply writing “labellum four-lobed”.

Then there’s the fact that colours are very much in the eye of the beholder. For example, flower colour is the most obvious means of distinguishing between *Dactylorhiza incarnata incarnata* (“flowers pink”: Fig. 1A) and *D. incarnata pulchella* (“flowers purple”: Fig. 1B). But do we all perceive these colours in the same way? Most observers would recognise that “purple” is a combination of red and blue hues, but what exactly is “pink”? If it is pale red, you are probably looking at a plant of subsp. *incarnata*. But if it is in fact pale purple, you are more likely to have encountered one of the many pale-flowered individuals of subsp. *pulchella* (Fig. 1C). Careful colour-matching will be needed to distinguish between these two subtly different possibilities. I have found the RHS colour chart to be especially useful in such circumstances (Fig. 1D), but you are unlikely to see explicit reference to its colour blocks in any flora.

Most floras quantify at least some characters, typically presenting each character as a range of values: for example, “spur length 13–22 mm”. Or we may be offered an inner range plus an outer range, thus: “spur length (13–)16–18(–22) mm”. However, we are rarely told what such statements actually mean. What is the statistical basis of such ranges, and what is the nature of the underlying raw data? Could the inner range represent the sample standard deviation and the outer range represent twice the sample standard deviation? And if so, what are the mean and median values? We are also very unlikely to be told precisely how any original measurements were taken. Where was the base of the spur considered to be located when measurement took place? And was the spur flattened prior to measurement?

Figure 1. Comparison of (A) a typical pink flower of *D. incarnata incarnata*, (B) a typical dark purple flower of *D. incarnata pulchella*, and (C) a less typical pale purple flower of *D. incarnata pulchella*, matched against (D) the relevant strips from the RHS colour chart.

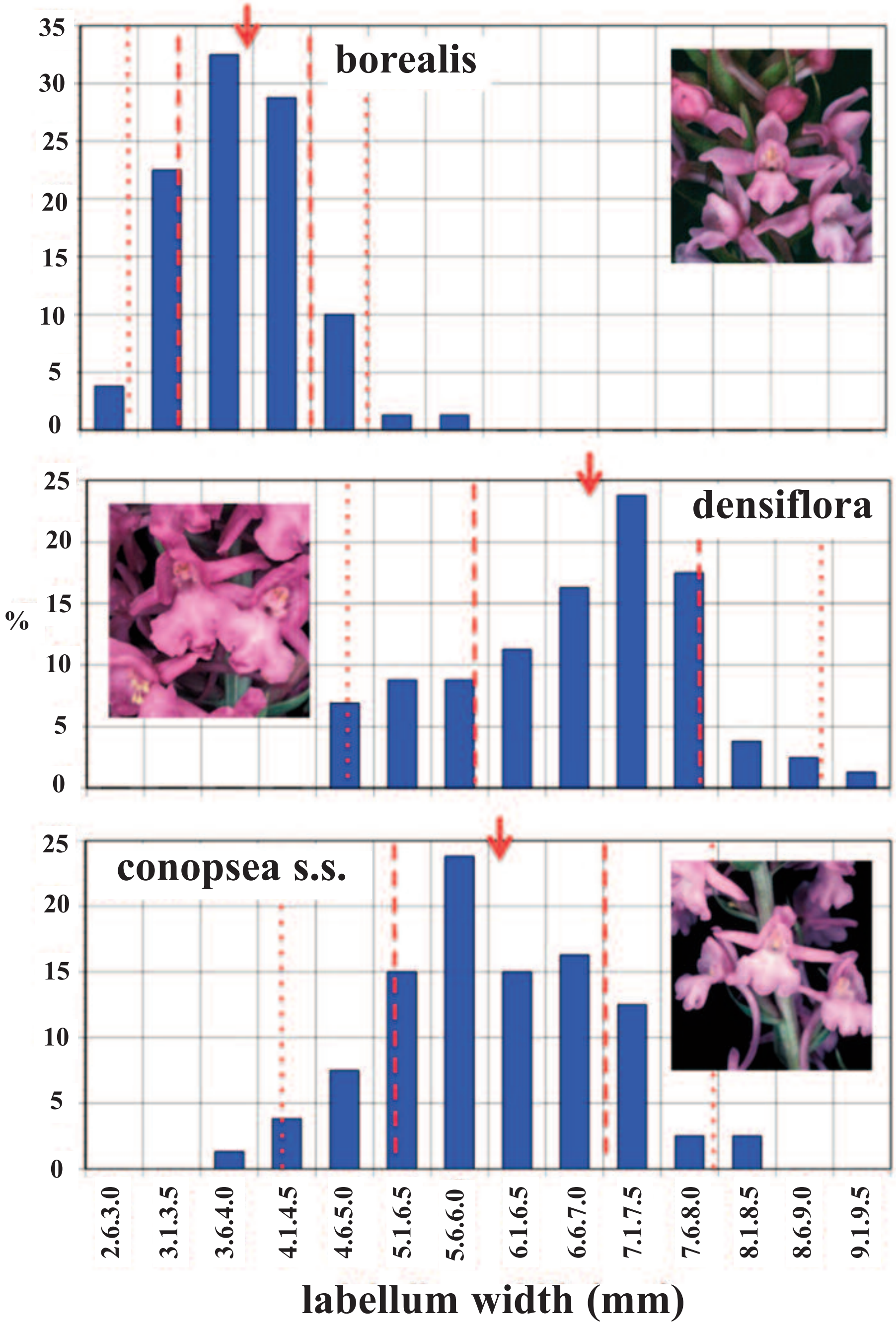
Then there are issues relating to sampling. Do the measurements represent herbarium specimens (which are reliably shrunken and distorted: Fig. 5A) or field data from live plants? How many individuals and populations were measured? (for example, only one plant of the majority of European orchid species has been studied for its chromosome number, yet a recent study based on extensive, continent-wide sampling showed that *Gymnadenia conopsea* alone maintains six different chromosome numbers in central Europe!). What kind of habitats did those plants occupy, and what geographical range did they collectively encompass? Or were the ‘data’ simply borrowed from ranges published in previous taxonomic accounts of the species? – a quick and easy solution in the case of European orchid studies, given the large number of accounts already available.

Comparative data

Life becomes even more difficult when we attempt to compare two or more closely related species. Accounts of congeneric species often fail to list the same characters for all taxa; for example, we may be presented with only spur length data for species A but only labellum length data for species B. And if we are fortunate enough to be given a full list of comparable characters, how do we judge the probability that this particular character will successfully discriminate between the species in question? Overlapping ranges of metric characters are the rule rather than the exception. Thus, if species A is awarded a spur length of 12–23 mm, but species B a spur length of 18–26 mm, how many plants of each of these two species have spur lengths of 18–23 mm and so by definition cannot be discriminated using this particular character? We simply cannot tell.

Ideally, we should instead be given probability statements (cf. Bateman & Denholm 1983). These are most easily achieved if one selects a threshold value between the species under comparison. Consider, for example, genuine labellum-width datasets for the three British *Gymnadenia* species (Fig. 2). This character clearly offers good discrimination between the wide-lipped *G. densiflora* and narrow-lipped *G. borealis*. Unfortunately, if we add to the comparison a third, intermediate-sized species, *G. conopsea s.s.*, the character becomes far less effective at distinguishing *G. conopsea* from either of the two remaining species. Nonetheless, because we have the unusual advantage of access to a substantial body of data that has been gathered from populations across the country using a carefully planned sampling strategy, we can at least estimate the relative success of this character in distinguishing among plants of these three species: 88% for *G. densiflora* vs *G. borealis* (optimal threshold = 4.8 mm), 58% for *G. conopsea* vs *G. borealis* (optimal threshold = 4.6 mm), but only 21% for *G. conopsea* vs *G. densiflora* (optimal threshold = 6.5 mm).

Of course, these percentage probabilities represent average success rates; the character will perform substantially less well in some populations, including occasional


borealis
35
30
25
20
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5
0
densiflora
%
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20
15
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5
0
conopsea s.s.
25
20
15
10
5
0
2.6.3.0
3.1.3.5
3.6.4.0
4.1.4.5
4.6.5.0
5.1.6.5
5.6.6.0
6.1.6.5
6.6.7.0
7.1.7.5
7.6.8.0
8.1.8.5
8.6.9.0
9.1.9.5
labellum width (mm)

mixed-species populations that have suffered some hybridisation. Then there's the small matter of the labellar spur continuing to elongate throughout the life of the flower (a fact revealed as a by-product of the HOS project measuring *Platanthera* spurs); the same phenomenon may also affect the remainder of the labellum. Evidently, in *Gymnadenia* (as in every other relevant genus), labellum width alone is insufficient to discriminate among the species, and further distinguishing characters must be added to labellum dimensions in order to achieve an acceptable success rate for identification. This observation that moves us neatly on to the contentious topic of identification keys, which feature in many floras and monographs.

Any regular user of dichotomous keys will be familiar with the uncertainties and high failure rate that they generally incur; only a very limited amount of the available data can be used, and those data are almost always presented as absolutes (i.e. statement true versus statement false) rather than probabilistic (i.e. statement true for X% of individual plants within the species). And even the best diagnostic characters in keys remain prey to the same issues of ambiguity of definition that dog basic descriptions. One well-known flora often resorts to keying out supposed species using flowering times, which does not encourage one's belief in the morphological distinctiveness of the plants in question. Moreover, once you have made an error while working through the key, that error is compounded by the hierarchical, tree-like structure inherent to any dichotomous key. This means that even if you are fortunate enough to realise that you have made an error, you are often obliged to suffer the frustration of restarting your journey through the key from the very beginning.

In my opinion, the most effective way to compare and identify species (and indeed taxa of other ranks) is not through a linear sequence of written descriptions but rather through a matrix-style table that compares each relevant taxon for each scored character. Instead of being given a range of values, we need to know the probability by which that character will allow us to discriminate that species from other comparable species. Comparing character states within such a table makes it much easier to identify which characters are most discriminatory (they are rarely the same spectrum of 'diagnostic' characters featured in previous floras), as well as ensuring that all credible characters have been scored for all species. Tabulation also ensures that the chosen characters have been scored consistently, using the same descriptive terms and, where relevant, employing the same units of measurement.

Figure 2. Spur-length data for (A) *Gymnadenia conopsea s.s.*, (B) *G. densiflora* and (C) *G. borealis* in the British Isles. Dashed lines indicate once and twice the standard deviation, and arrows indicate mean values for each species (from Bateman & Denholm, unpublished).

Illustrations

Apart from written descriptions and keys, both usually based wholly on morphological characters, we are also often provided with illustrations. These typically depict only one or two individuals that must suffice to represent that species in its entirety; in other words, they are the illustrative equivalents of holotype specimens. In the 19th Century these illustrations were commonly black-and-white illustrations based on woodcuts or, later, on engraved line drawings, which in many cases did actually depict the benchmark holotype specimen. Line drawings persisted into the 20th Century (e.g. Ross-Craig 1971), when they were joined or replaced by halftone photographs and/or watercolour paintings (e.g. Landwehr 1977).

However, in 21st Century treatments of orchids, illustrations are more likely to be colour photographs (e.g. Kreutz & Dekker 2000; Delforge 2006; Kretzschmar et al. 2006) – a category of images that offers both advantages and disadvantages over halftones. For characters other than those relying on colour, it is often easier to emphasise the key features in a line drawing than in a photograph because apparently irrelevant details can be omitted. And even when colour is important, there can be significant differences in perceived colour hues between natural light (Fig. 3A) and electronic flash (Fig. 3B). Admittedly, these differences can be compensated for digitally, when presumably the natural lighting regime should be regarded as the preferred standard.

But the greatest (and most easily avoided) error in illustration, perpetrated by almost every recent author of a flora or monograph, is to fail to provide a scale to accompany each image. Interestingly, this has become a greater problem in the age of the photograph than the age of the drawing, when most of the better practitioners provided explicit scales or magnifications (e.g. Ross-Craig 1971). The consequent mis-

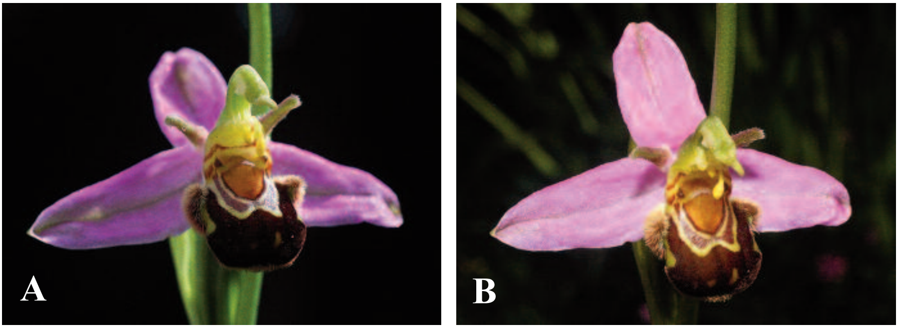


Figure 3. Single flower of *Ophrys apifera* imaged digitally in (A) natural light and (B) built-in flash; note the contrasting colour tones of the sepals and exceptionally light-absorbing hirsute labellum.

Figure 4. Flower-size comparison of (A) *Ophrys sphegodes grigoriana* and (B) *Op. sphegodes cretensis* co-occurring on a Cretan hillside (horizontal dimension of both images = 21 mm)

conception of scale can be profound. I well remember my shock at finding *Herminium monorchis* and *Hammarbya paludosa* for the first time and belatedly realising how small they were, while in the case of my first encounter with *Spiranthes spiralis*, I sat in the middle of the colony for ten minutes before noticing the multitude of flower spikes! Conversely, I was equally startled to discover how imposing *Ophrys sphegodes grigoriana* (Fig. 4A) could become in its chosen habitat on Crete, contrasting strongly with the diminutive flowers of the co-occurring *Op. sphegodes cretensis* (Fig. 4B). An image is often captioned with a locality and/or date – why not also with a magnification?

Emergent and/or extrinsic properties

Thus far, we have focused on the morphology of the plants in question. But most floras and monographs also include information on flowering period, habitat preference and geographic distribution. To some degree, flowering period and habitat preference are, like morphology, innate properties of individual orchids – they are influenced by the physiology of the plant, which is in turn influenced by its genome. But of course these properties are also strongly influenced by the plant's environment. Flowering time (often abbreviated in floras to Roman numerals, e.g. "V–VII") in particular tends to be described as encompassing periods of two to three months, whereas the flowering of a single plant is unlikely to exceed two weeks. Flowering times for species can be quoted much more precisely, and thus made much more useful, if they are adjusted for latitude, altitude and/or local climate.

Yet more problematic is geographical distribution. Certainly, the ways that distribution is depicted have improved considerably in recent decades. With a few exceptions (notably Delforge 2006), lists of countries or regions wherein a species reputedly occurs have been replaced by distribution maps. In the UK, hectads (10 km squares) have become standard for national recording while tetrads (2 km squares) or smaller areas are preferred for local recording. In Continental Europe, recording systems vary much more in the amount of detail presented, ranging from amoeboid 'blobograms' through crude political regions and various forms of latitudinal-longitudinal grids to actual GPS-referenced localities underlain by major geographical features (e.g. Kreutz & Dekker 2000). It has also become commonplace to distinguish between recent and older records using contrasting dot colours. Perhaps most impressive is the regional orchid flora of Bergamo (Ferlinghetti *et al*. 2001), which scored each known orchid population of each species for several parameters, thus allowing publication of histograms for flowering period, habitat type and altitude; even the preferred aspect of sloping localities was presented as data-rich compass-diagrams.

Particular difficulties arise if morphologically similar taxa are mapped separately. Populations of, say, *Anacamptis morio* in the British Isles maintain individuals that are identical to plants ascribed to the segregate 'species' *A. picta*, *A. albanica* and *A. champagneuxii* in the central and eastern Mediterranean. This phenomenon reaches its acme in *Ophrys* species, where the few populations of *Op. fuciflora* present in Kent contain individuals that in the eastern Mediterranean would be morphologically assignable to several supposed species – indeed, to multiple species groups *sensu* Delforge (Devey *et al*. 2009). And each Mediterranean island has in recent years miraculously acquired its own endemic species of almost every species group of *Ophrys*. Does it really make sense to develop classifications where geographical location is in effect used as the primary criterion for identification?

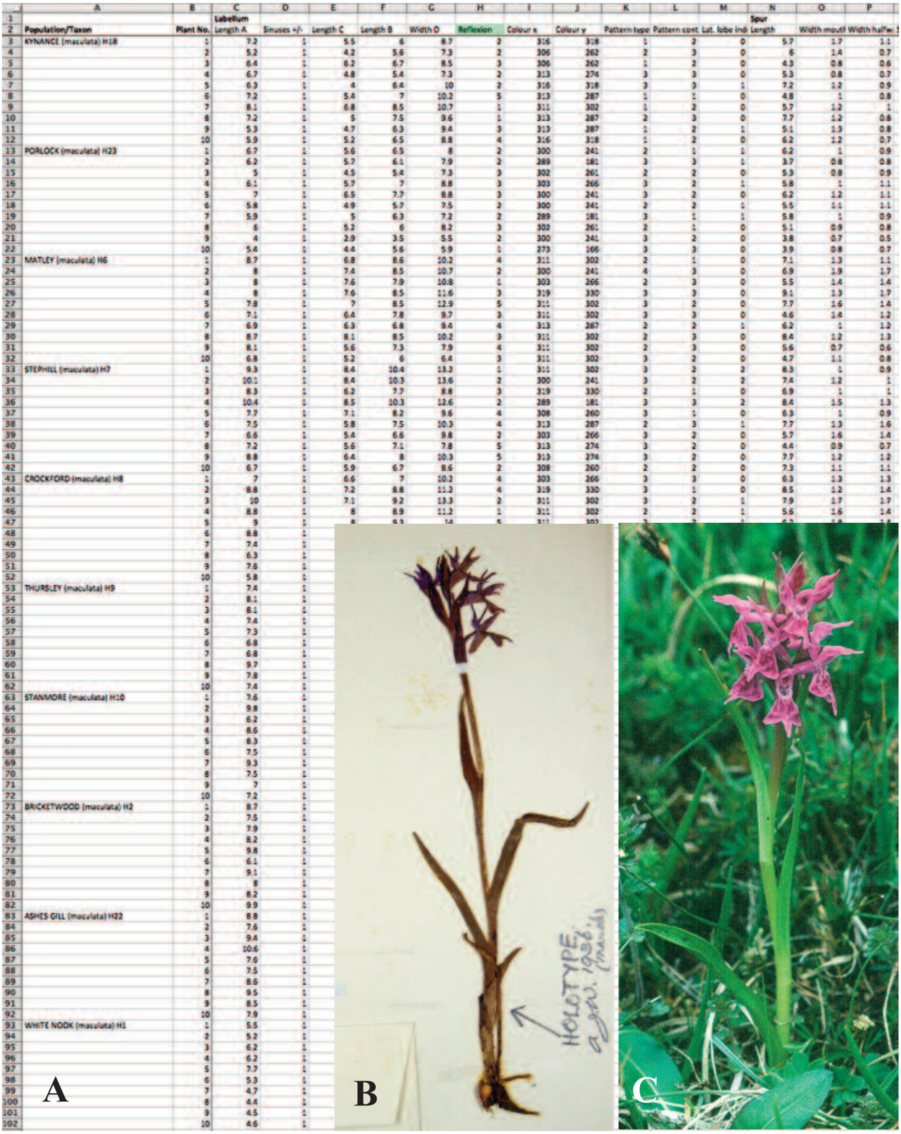
But the most problematic criterion of all is the increasing trend to identify European orchids 'ethologically', by observing their symbiotic partners – typically pollinating insects, but potentially also by using DNA to identify mycorrhizal associates. The morphology of a plant is dictated largely by its genes, and genes within plant populations can change only relatively slowly through directional selection or drift. Orchid populations are, in effect, buffered (albeit imperfectly) in several ways against radical changes in their appearance. But ecological and ethological properties can change more-or-less instantaneously, at the whim of the symbiotic organisms, their environment(s), or both. Also, available data describing such interactions tend to be too limited to warrant the sweeping generalised statements that often ensue. Such data are better viewed as a partially independent *test* of an identification made previously using characters of the orchids themselves (Bateman 2012).

Potential high-tech improvements

Much thought has been given in recent years to improving the standards of taxonomic 'tools', leading to several relatively well-funded national and international initiatives. The most common objective has been to collate existing data, both written and pictorial, in order to make that information more readily available; this is usually done electronically via the Web. The main advantage of this approach is that the aggregated data are more easily searched, eliminating the need to assemble many different sources of information in a single physical location. Having said that, huge improvements in the efficiency of search engines such as Google make accessing relevant datasets relatively easy, even when they have not been brought together on a single server.

Similar efforts have been made to update identification keys for the electronic era. Indeed, an illustrated, searchable electronic key to British orchids was developed as long ago as 1988 by Richard Pankhurst, using his mischievously named Pankey program. However, I would argue that rendering morphology-based identification guides electronic represents at best a modest advance in our ability to identify European orchids accurately. An identification tool can only be as good as the quantity, quality and diversity of the underpinning data.

Even more exciting are the prospects for DNA sequencing in field conditions. I have written in the pages of *JHOS* before regarding the potential value of developing a palmtop sequencer (Bateman 2009). In my opinion, the long-awaited (at least, by me!) hand-held field sequencer could already have been made available to natural historians, had developers been willing to invest more heavily in miniaturising the necessary technology. I believe that this has not yet occurred because developers, professional taxonomists and natural historians have all under-estimated the potential value of such a device, which in consequence has not received the necessary levels of 'political' commitment or practical resourcing. An affordable and effective field sequencer, supported by digital images and linked by satellite to the vast repository of existing DNA sequences held at GenBank, would soon greatly increase the number of reliable DNA sequences available for use in further plant identifications – an excellent example where reciprocal illumination could greatly improve current taxonomic practices (Bateman 2013).



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1			Labellum											Spur		
2	Population/Taxon	Plant No.	Length A	Sinuses +/-	Length C	Length B	Width D	Reflexion	Colour x	Colour y	Pattern type	Pattern cont.	Lat. lobe ind	Length	Width mout	Width half
3	KYNANCE (maculata) H18	1	7.2	1	5.5	6	8.7	2	316	318	1	2	0	5.7	1.7	1.1
4		2	5.2	1	4.2	5.6	7.3	2	306	262	2	3	0	6	1.4	0.7
5		3	6.4	1	6.2	6.7	8.5	3	306	262	1	2	0	4.3	0.8	0.6
6		4	6.7	1	4.8	5.4	7.3	2	313	274	3	3	0	5.3	0.8	0.7
7		5	6.3	1	4	6.4	10	2	316	318	3	3	1	7.2	1.2	0.9
8		6	7.2	1	5.4	7	10.2	5	313	287	1	1	0	4.8	1	0.8
9		7	8.1	1	6.8	8.5	10.7	1	311	302	1	2	0	5.7	1.2	1
10		8	7.2	1	5	7.5	9.6	1	313	287	2	3	0	7.7	1.2	0.8
11		9	5.3	1	4.7	6.3	9.4	3	313	287	1	2	1	5.1	1.3	0.8
12		10	5.9	1	5.2	6.5	8.8	4	316	318	1	2	0	6.2	1.2	0.7
13	PORLOCK (maculata) H23	1	6.7	1	5.6	6.5	8	2	300	241	2	1	1	6.2	1	0.9
14		2	6.2	1	5.7	6.1	7.9	2	289	181	3	3	1	3.7	0.8	0.8
15		3	5	1	4.5	5.4	7.3	3	302	261	2	2	0	5.3	0.8	0.9
16		4	6.1	1	5.7	7	8.8	3	303	266	3	2	1	5.8	1	1.1
17		5	7	1	6.5	7.7	8.8	3	300	241	3	2	0	6.2	1.2	1.1
18		6	5.8	1	4.9	5.7	7.5	2	300	241	2	2	1	5.5	1.1	1.1
19		7	5.9	1	5	6.3	7.2	2	289	181	3	1	1	5.8	1	0.9
20		8	6	1	5.2	6	8.2	3	302	261	2	1	0	5.1	0.9	0.8
21		9	4	1	2.9	3.5	5.5	2	300	241	3	2	0	3.8	0.7	0.5
22		10	5.4	1	4.4	5.6	5.9	1	273	166	3	3	0	3.9	0.8	0.7
23	MATLEY (maculata) H6	1	8.7	1	6.8	8.6	10.2	4	311	302	2	1	0	7.1	1.3	1.1
24		2	8	1	7.4	8.5	10.7	2	300	241	4	3	0	6.9	1.9	1.7
25		3	8	1	7.6	7.9	10.8	1	303	266	2	3	0	5.5	1.4	1.4
26		4	8	1	7.6	8.5	11.6	3	319	330	3	3	0	9.1	1.3	1.7
27		5	7.8	1	7	8.5	12.9	5	311	302	3	2	0	7.7	1.6	1.4
28		6	7.1	1	6.4	7.8	9.7	3	311	302	3	3	0	4.6	1.4	1.2
29		7	6.9	1	6.3	6.8	9.4	4	313	287	2	2	1	6.2	1	1.2
30		8	8.7	1	8.1	8.5	10.2	3	311	302	2	3	0	8.4	1.2	1.3
31		9	8.1	1	5.6	7.3	7.9	4	311	302	2	3	0	5.6	0.7	0.6
32		10	6.8	1	5.2	6	6.4	3	311	302	3	2	0	4.7	1.1	0.8
33	STEPHILL (maculata) H7	1	9.3	1	8.4	10.4	13.2	1	311	302	3	2	2	8.3	1	0.9
34		2	10.1	1	8.4	10.3	13.6	2	300	241	3	2	2	7.4	1.2	1
35		3	8.3	1	6.2	7.7	8.8	3	319	330	2	1	0	6.9	1	1
36		4	10.4	1	8.5	10.3	12.6	2	289	181	3	3	2	8.4	1.5	1.3
37		5	7.7	1	7.1	8.2	9.6	4	308	260	3	1	0	6.3	1	0.9
38		6	7.5	1	5.8	7.5	10.3	4	313	287	2	3	1	7.7	1.3	1.6
39		7	6.6	1	5.4	6.6	9.8	2	303	266	3	2	0	5.7	1.6	1.4
40		8	7.2	1	5.6	7.1	7.8	5	313	274	3	2	0	4.4	0.9	0.7
41		9	8.8	1	6.4	8	10.3	5	313	274	3	2	0	7.7	1.2	1.2
42		10	6.7	1	5.9	6.7	8.6	2	308	260	2	2	0	7.3	1.1	1.1
43	CROCKFORD (maculata) H8	1	7	1	6.6	7	10.2	4	303	266	3	3	0	6.3	1.3	1.3
44		2	8.8	1	7.2	8.8	11.2	4	319	330	3	1	0	8.5	1.2	1.4
45		3	10	1	7.1	9.2	13.3	2	311	302	3	2	1	7.9	1.7	1.7
46		4	8.8	1	8	8.9	11.2	1	311	302	2	2	1	5.6	1.6	1.4
47		5	9	1												
48		6	8.8	1												
49		7	7.4	1												
50		8	6.3	1												
51		9	7.6	1												
52		10	5.8	1												
53	THURSLEY (maculata) H9	1	7.4	1												
54		2	8.1	1												
55		3	8.1	1												
56		4	7.4	1												
57		5	7.3	1												
58		6	6.8	1												
59		7	6.8	1												
60		8	9.7	1												
61		9	7.8	1												
62		10	7.4	1												
63	STANMORE (maculata) H10	1	7.6	1												
64		2	9.8	1												
65		3	6.2	1												
66		4	8.6	1												
67		5	8.3	1												
68		6	7.5	1												
69		7	9.3	1												
70		8	7.5	1												
71		9	7	1												
72		10	7.2	1												
73	BRICKETWOOD (maculata) H2	1	8.7	1												
74		2	7.5	1												
75		3	7.9	1												
76		4	8.2	1												
77		5	9.8	1												
78		6	6.1	1												
79		7	9.1	1												
80		8	8	1												
81		9	8.2	1												
82		10	9.9	1												
83	ASHES GILL (maculata) H22	1	8.8	1												
84		2	7.6	1												
85		3	9.4	1												
86		4	10.6	1												
87		5	7.6	1												
88		6	7.5	1												
89		7	8.6	1												
90		8	9.5	1												
91		9	8.5	1												
92		10	7.9	1												
93	WHITE NOOK (maculata) H1	1	5.5	1												
94		2	5.2	1												
95		3	6.2	1												
96		4	6.2	1												
97		5	7.7	1												
98		6	5.3	1												
99		7	4.7	1												
100		8	4.4	1												
101		9	4.5	1												
102		10	4.6	1												

Figure 5. Comparison of (A) the holotype of *Dactylorhiza traunsteinerioides francis-drucei*, (B) a photograph of an *in situ* plant of this taxon, and (C) a tiny fragment of the morphometric database of British and Irish dactylorchids (1344 plants × 52 quantified characters) assembled since 1981. All three items are important, but which is potentially most informative?

Potential low-tech improvements

I have already hinted at some of the simple improvements that I believe could be made to monographs and floras, such as ensuring that illustrations bear millimetric scales, quantifying morphological characters wherever possible (and it is *always* possible, given sufficient thought!), and presenting formal descriptions in a more rigorous statistical framework. However, there is no doubt in my mind that the single greatest low-tech advance would actually mirror the single greatest high-tech advance – *we as a community need to systematically gather large quantities of original data* (Fig. 5).

In this essay I have deliberately minimised discussion of the many issues surrounding the definition, delimitation and naming of taxa, having written about these topics on several previous occasions (cf. Bateman 2012). Nonetheless, it ultimately becomes impossible to ignore the two-way feedback loop that should by now be providing a genuinely dynamic link between the large number of us who identify orchids and the much smaller number of us who formally circumscribe and name them. At present, neither group is routinely feeding information to the other, and in my opinion at least, this failure constitutes a criminal waste of effort on both sides of the ‘great divide’.

Only by routinely feeding information from identifications – irrespective of whether they are attempted using morphology or molecules – back into communal databases will we achieve significant improvements in our circumscription of species and infraspecific taxa. Only when a species has been well-circumscribed in an explicit conceptual framework and using a large and diverse body of data, the plants carefully sampled and the tabulated information rigorously analysed, can we identify the most effective diagnostic characters, morphological or molecular (Bateman 2012). And without optimal circumscription of taxa there can be no such thing as an optimally accurate identification, let alone accurate distribution maps.

In summary, we badly need to make a concerted effort to establish practical systems that will allow reciprocal illumination loops to operate for morphological, molecular, ecological and distributional data. Without them, floras and monographs will continue to perform well below their potential, and fieldworkers will continue to experience the periodic frustration of encountering an orchid that is at best ambiguous and at worst anonymous.

Dedication

This article is dedicated to the late Richard Pankhurst (d. 26th March 2013), in recognition of his conceptual contributions to plant recognition.

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Pollination in the Early-purple Orchid

Mike Gasson

My interest in Early-purple Orchid pollination began some three years ago as a by-product of monitoring herbivore impacts. The largest remaining area of ancient woodland in Norfolk is Foxley Wood, which has existed as a managed habitat since the times of the Domesday Book. Whilst maintaining the woodland rides in Foxley back in the late winter of 2009/2010, I realised the extent to which emergent rosettes and flower buds of *Orchis mascula* are consumed by herbivores (Figure 1). Deer are

Fig. 1: Heavy browse on emergent *Orchis mascula* rosette and spike (top) and survival of remnant flowers all of which set fruit (bottom).

Photos by Mike Gasson

the main culprits, with the Reeves Muntjac the prime offender. With the support of Norfolk Wildlife Trust, I started a monitoring project that was intended to clarify the impact of deer on the wood's orchid populations using a variety of exclusion experiments and a total mapping of the *O. mascula* population over three seasons (Figure 2). The major conclusion was that whilst heavy browse weakened the plants, it did not extend to the opened flower spikes with even extensively damaged plants still able to set fruit on what was left by the deer. My suspicion is that the well documented "tom cat" odour associated with the flowers of *O. mascula* acts as a deterrent to would be "browsers". This is in marked contrast to the wood's Greater Butterfly-orchids, whose nectar-rich flowers appear to be selectively browsed by deer – but that is another story!

I was especially concerned to establish the impact of browse on the recruitment of new Early-purple Orchid plants and monitored fruit set frequencies at a series of stations throughout the wood. Figure 2 summarizes data from the 2010 season. Before starting this study, I had the impression that *O. mascula* pollination was relatively inefficient, being the expectation for an allogamous orchid species that relied on food deception to attract its pollinators. I was aware of the pioneering work of Darwin (1877) and Müller (1883) that first established the fundamentals of *Orchis* pollination, as well as the importance of naive bumblebee queens as the major pollinating insect. Also, the detailed work of Nilsson (1983) revealed low frequencies of seed set, as well as the observation that the lowest flowers on an orchid spike were pollinated preferentially . Much of this was reviewed recently by Jacquemyn *et al*. (2009). Hence, it was something of a surprise to find such high levels of fruit set in the Early-purple Orchids of Foxley Wood.

Most of the wood's Early-purple Orchids have an association with strong stands of Bluebell (*Hyacinthoides non-scripta*), leading to the thought that these rewarding companion flowers may play a key role in maintaining strong local concentrations of pollinating insects. Although both Darwin (1877) and Müller (1883) thought that insect visitors extracted a reward other than nectar from the spur lining, it is now generally accepted that no reward is offered and that *O. mascula* is a food deceptive orchid, as first proposed by Delpino (Müller, 1883). In Foxley Wood, bumblebees were frequently encountered on the Bluebells, although observing them as orchid visitors was a rare event. In part, this may be because it was not, at the time, the focus of monitoring. Also, others have found it difficult to record the pollination event: Darwin (1877) never did and Nilsson (1983) reports spending 30 hours to gain three observations of bumblebee visits to *O. mascula*. I made one casual observation of *Bombus terrestris* on *O. mascula* and its behaviour was completely consistent with previously published accounts. The bee spent only a short time on an individual plant, visiting a few of its flowers, before moving on to the base of another orchid's flower spike. Many different orchids were visited in this way. It is well established that *O. mascula* has evolved a finely tuned mechanism with caudicle bending time adapted to the time a pollinator typically spends on an individual plant. The result is that cross pollination is promoted.

Rather more frequent pollination events were recorded in an early study by Müller (1883) for a dense population of Early-purple Orchids on an especially favourable day for insect activity. Five pollination events were recorded in a few hours and, interestingly, potential pollinators were captured and checked for the presence of orchid pollinia. A return of 32 positives amongst 97 bumblebees suggests that the orchids had been visited regularly.

The part of Foxley Wood where my own pollination event was observed happened also to have one of the highest recorded fruit set rates (61%). However, there was a problem in that the site is relatively remote from the main concentrations of Bluebells in the wood (Figure 2). This rather dampened my belief in *Hyacinthoides non-scripta* as a key companion species that contributed to higher orchid fruit set by holding pollinators within the local habitat. In the 2011 season, a chance observation in this same area revived the idea with a twist. This particular part of the wood had been coppiced recently and whilst it lacks Bluebells it does contain a very strong population of Bugle (*Ajuga reptans*). On a sunny morning, whilst counting the flowering spikes of *O. mascula*, I watched for an hour or so as large numbers of white butterflies (Orange Tip *Anthocharis cardamines*, Small White *Pieris rapae* and Green-veined White *Pieris napi*) "nectared" on the Bugle plants (Figure 3). The interesting observation was that the butterflies repeatedly visited the orchid flowers, searching for nectar, switching between individual plants before returning to the more abundant Bugle. Because of the flower and insect morphologies involved it is highly unlikely that butterflies are effective pollinators of *O. mascula* but it was very clear that the presence of Bugle as a rewarding companion species was responsible for the frequent butterfly visits to the orchid flowers. Doubtless the same would be

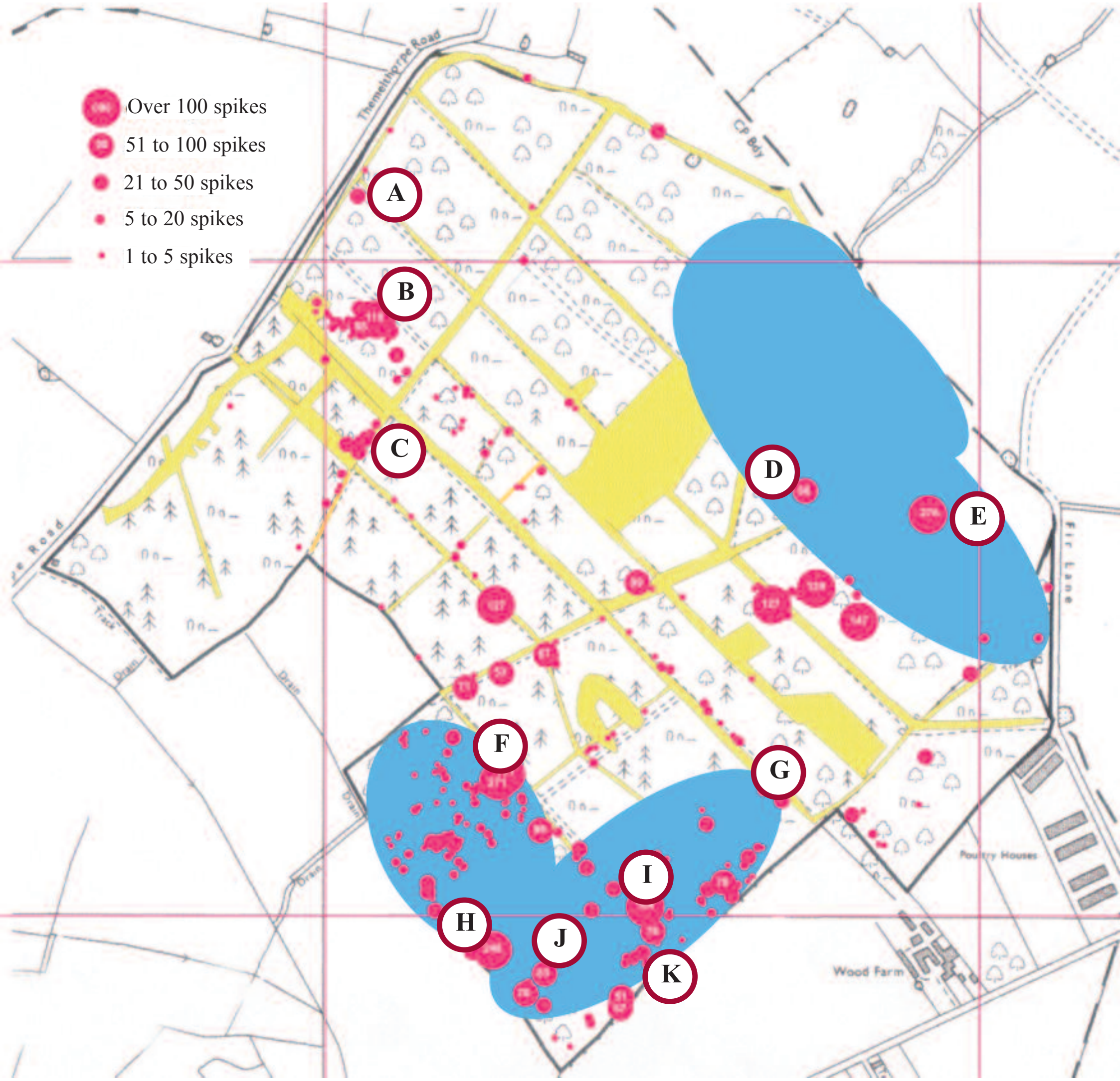

Fig. 2: Map of Foxley Wood showing the distribution of 5,508 flowering plants of *Orchis mascula* in the 2010 season. Solid red circles are GPS locations for groups of plants. Letters in brown rings are the locations were fruit set was measured later in the same season. The figures are percent fruit set followed in brackets by the total number of flowers counted at each location: A – 47% (102); B – 61% (265); C – 36% (111); D – 53.1% (96); E – 62% (293); F – 42% (442); G – 34% (103); H – 50% (272); I – 47% (112); J – 52% (304); K – 39% (117). The global fruit set for the entire wood is 49% (2,222). Blue underlays indicate the distribution of Bluebell (*Hyacinthoides non-scripta*) in the wood; an estimate of Bluebell fruit set was 62% (302). Bumblebee pollination (2010) and repeated white butterfly visits (2011) were observed in area B and a re-evaluation of fruit set in 2011 gave higher frequencies of 83% (414). Early Purple Orchid fruit set in other Norfolk woods were measured during 2010 with the following results: Honeypot Wood 48% (208); Wayland Wood 34% (160); small wood near Loddon 37% (186).

Fig. 3: Small White butterfly taking nectar from Bugle (*Ajuga reptans*)
Photo by Mike Gasson

true for effective pollinators such as bumblebee queens. It may be relevant that Jacquemyn *et al*. (2008) reported increased fruit set as a consequence of coppice management, although the highest Foxley fruit set in 2010 (62%) was from an area of mature woodland maintained as a non-intervention area.

Later in the same season, I again counted fruit set in this area. From 17 plants and 414 flowers the global fruit set was 83%, ranging from 55 to 100% for individual plants. Hence, overall these East Anglian Early-purple Orchids behave very differently from Swedish populations that have become the established norm in many accounts of Early-purple Orchid pollination. In my local orchids there is absolutely no suggestion that the lower flowers are pollinated preferentially and fruit set frequencies are vastly higher than those recorded in Sweden by Nilsson. For example, using data collated by Claessens & Kleynen (2011) the overall fruit set for Swedish *O. mascula* was 8% (for 29,388 flowers) with a range for individual populations of 3% to 15%. Another example of fruit set frequency comes from Dormont *et al.* (2010). Their study was concerned primarily with the evolution of colour polymorphism and they presented data to suggest that the presence of white morphs within a population of *O. mascula* had the effect of elevating fruit set frequencies in the normal purple morphs. What interests me is the fact that these relatively isolated orchid populations on a limestone plateau in southern France had generally low fruit set frequencies, the elevation reported amounting to a shift from 6% for an exclusively purple population to 27% for one with both purple and white morphs. Dormont *et al.* (2010) confirmed the positive influence of a colour variant by adding artificial white lures to an exclusively purple population. Whilst this study and its interpretation are logical, it is totally trumped in frequency terms when a population such as that at Foxley generates fruit set twice as high as the elevated frequency cited by Dormont *et al.* (2010). Variant morphs are extremely rare within the Foxley Wood population of Early-purple Orchids. In 2010, only 3 pale morphs (2 pink and one near white) were found amongst 5,508 flowering plants.

In contrast, there are other reports of much higher fruit set in German populations of *O. mascula*. Again using the data collated by Claessens & Kleynen (2011), records from Germany have an overall fruit set frequency of 33% (for 5,316 flowers) with a range for individual populations from 7% to 68%. Also, I have checked fruit set frequencies at several other Norfolk woods finding broadly similar frequencies (Figure 2), although none as high as those for Foxley Wood.

From all of this information I have gained the impression that fruit set frequency varies markedly depending on the number of pollinating insects maintained in a particular habitat. Given relatively low numbers of pollinators the classic picture emerges with poor seed set and preferential pollination of the lower flowers on a spike. This pattern is typical of the populations studied by Nilsson (1983) and Dormont *et al*. (2010). But where larger numbers of pollinating insects are held within a local habitat much higher fruit set occurs and the oft-mentioned preferential pollination of the lower flowers is not apparent. In Foxley Wood, the major factor contributing to the retention of active pollinating insects appears to be the presence of large numbers of companion species that, unlike the Early Purple Orchid, do offer a nectar reward. The two best candidates for this role are Bluebell (*Hyacinthoides non-scripta*) and Bugle (*Ajuga reptans*). This is not an original concept but one that was first proposed by Thompson (1978) and studied in European orchids by Johnson and colleagues (e.g. Johnson *et al*., 2003). It has been called “Magnet Species Effect” and as this name implies, it may function by increasing the local abundance of pollinators.

Looking at information on *O. mascula* pollination in recent general orchid texts reveals variation in the views of well-respected authors:

Foley & Clarke (2005) have “the Early Purple Orchid has a rather repugnant cat-like scent, but small insects are attracted to the flowers and very successfully effect pollination, shown by the resulting high quantity of seed that is set.”

Harrap & Harrap (2005) follow a detailed description of classic bee-promoted pollination biology with “Early Purple Orchid is self-compatible and is sometimes self-pollinated”. With respect to fruit set frequency they have “Seed set is variable, with the lowest, earliest-opening flowers most likely to be pollinated.”

Kretzschmar *et al*. (2007) have “The species is allogamous: this is confirmed by the percentage of flowers setting seed, which lies between 23% and 48%.”

Hence, there does seem room for more data gathering and further exploration of pollination in *O. mascula*. Now is a good time to check out flowering Early-purple Orchids for companion flowers and possible pollinators. It would be interesting to get records for fruit set frequency from UK populations in different habitats. I have placed a recording form on the HOS website and will happily collate any observations and information from members. Whilst not in quite the same class as the very successful spur-length study co-ordinated by Richard Bateman (Bateman & Sexton, 2009; Bateman *et al*., 2012), there is an opportunity here to pool resources and maybe throw a little more light on what remains an imperfectly understood process.

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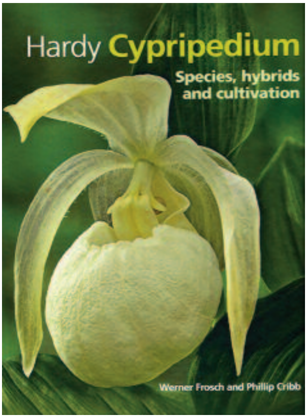
Book Review:
Hardy Cypripedium Species, Hybrids and Cultivation
Celia Wright



Hardy Cypripedium Species, Hybrids and Cultivation by Werner Frosch & Phillip Cribb; Kew Publishing 2012; ISBN 978-1-84246-464-9; 160pp; £45.

As a lover and grower of Cypripediums, I have been looking forward to the publication of this book for some time. It brings together as authors a skilled botanist and expert grower, both of whom have travelled extensively to observe these plants growing in the wild. Phil Cribb's previous work (The Genus Cypripedium, Timber Press 1997) will remain a useful reference for detailed botanical information, but this book updates some aspects and adds much, especially with its many high quality photographs and discussion of hybrids as well as species.

In their preface, the authors say that they will attempt to show the diversity of the cypripedium species and their natural and artificial hybrids. They certainly achieve this aim. Following a description of the genus with a list of its sections and subsections, each species is described within its section using a standard format across two facing pages. Information on naming, distribution and habitat and a clear description of the plant and its flowers are accompanied by a number of excellent colour photographs. The latter show the plant in its habitat and close up views of the flowers, illustrating variations that occur. Subspecies and varieties are treated in the same way. Presenting the information in this way is very effective. A general impression of each species is obtained quickly and easily but considerable detail is available on the same pages.

A short section follows on the ten natural hybrids known to occur, with a reference to their publication in the literature and a note on their distribution. Eight of the ten are illustrated. More interesting to cypripedium growers will be the much larger section on artificial hybrids, over 100 of which have now been registered. They are listed with their female (pod) and pollen parents, year of registration and registered grower. Most are illustrated. This will be immensely helpful to those wishing to grow these plants in their gardens but are uncertain which to choose. The photographs are the easiest guide to appearance, where everyone has their own preferences, while the parentage supplies information on the growing conditions they are likely to enjoy. The authors encourage us to try the hardy slipper orchids in our gardens, particularly as they are often easier than the species. The information here will certainly encourage me to widen the range I grow.

The only section of the book I found disappointing was the one on cultivation. It would have benefited from much tighter editing with some information (particularly in the substrate and planting sections) being quite confusing. The diagram of a planted cypripedium adds to the confusion around the use of the words compost, soil and substrate and what should be used in different layers. I found the information on Werner Frosch's website clearer than that in the book and would encourage readers to look at http://www.cypripedium.de/English/planting/planting.html. The subject of pot culture is addressed separately; a method of growing in almost nutrient free substrate is described, together with its associated feeding regime. Other growers use some organic material in their composts and readers may wish to compare the different methods. Inorganic compost is also preferred for growing young seedlings. Pests are covered briefly with some useful photographs.

The strengths of this book far outweigh its weaknesses. It can be read for specific information or purely for the pleasure of looking at photographs of these wonderful plants. My copy will be well used. If you love, grow or would like to grow cypripediums, I suggest you get a copy of your own. It may seem expensive, but so are flowering size cypripedium plants, and this volume will help you to choose wisely and grow well.

Book Review: *Ophrys d'Italia*
Paul Harcourt Davies

Ophrys d'Italia by Rémy Souche & Rolando Romolini; La Société Occitane d'Orchidologie; 2012; ISBN 978 -2-918075-02-8; 576pp; 65€.
This book (and others by Rémy Souche) can be obtained from http://www.ophryshybrides.com

Perhaps on a subconscious level, one of the reasons I came to live in Italy is the deep interest in and passion that I have for the genus *Ophrys*. Therefore, the volume *Ophrys d'Italia* is a proverbial feast for the eyes. The book is written by, and copiously illustrated with, photographs from Rémy Souche and Rolando Romolini. Many HOS members will already be aware of other superb works by Rémy Souche on the orchids of France, *Ophrys* hybrids etc. As a bonus, there are the delightful illustrations of Lorenzo Dotti who paints superbly, combining great accuracy with an exceptional ability to capture the elusive 'spirit' of the flowers.

In fact, you need read no further for, if you have any interest in Italian *Ophrys* – or just love superbly illustrated works on European orchids – then you will want it, I promise you. There is a parallel French / Italian text but then the images are a universal language and they form the greater part of this book. In fact, if you have this work at hand then I think it unlikely that you will encounter any *Ophrys* taxon in Italy (including Sardinia, Sicily and other islands) to which you cannot give a name.

The 576 pages are crammed with detailed *Ophrys* close-ups with a high level of photographic reproduction, including those that show the stigmatic cavity where this is a useful diagnostic feature. It is not a pocket-sized volume and thus not truly portable, given the severe weight restrictions on the budget flights many of us use to get a fix of spring orchids.

Each orchid taxon is described in detail with distribution maps and a special feature is the numerous photographs depicting each *'locus classicus'* from which the holotype species was originally described. Each taxon is allocated a double page spread (at least) and numerous images reveal the extent of variation in labellum pattern. A plethora of hybrids is also illustrated, in a separate section, plus orchid entities to which no name has yet been given.

If you wish to delve into the text then you will need a good level of either French or Italian – or take the time to copy bits into Google Translate! However, I can assure you that it will be worth the effort because there is a monumental amount of carefully researched detail from lists of pollinators to many of the botanists who have contributed to the substantial literature on this vexed genus. There are separate chapters on fungal biology (Marc-André Selosse), phylogeny (Salvatore Cozzolino) and pollination (Nicholas J. Vereecken) as well as on orchid protection, taxonomic problems and much more.

In setting out their taxonomic stall Messrs Romolini & Souche have widely adopted a criterion proposed by Paulus & Gluck which, stated simply, says that if two morphologically similar taxa have separate ranges of distribution and are pollinated by different hymenopteran species then they are to be regarded as distinct species. Problems potentially arise with this assumption where there are areas of overlap, for instance, and though we may well be looking at the conditions for evolution of separate taxa, perhaps giving a name is being pre-emptive?

I have never made a secret of the fact that I am at odds with the proliferation of so-called species that current publications reveal. Rémy Souche knows my views and we correspond extremely amicably as fellow 'orchid lovers' – we are, as Rémy says, of a different 'church'. There are no rights and wrongs in this for what we are proposing are artificial systems to 'bind' the most capricious of orchids. It always amazes me how well the binomial system of classification initiated by *Linnaeus* has served so well and for so long. I appreciate how careful the authors have been in their efforts to be both logical and consistent in applying the criteria chosen and, as earlier remarked, you will find everything you need to attach a name, which is what most readers will want.

Naming *Ophrys* is a vexed question and some people take it very seriously with differences developing into slanging matches – the not very scientific approach. However, if you delve, this is not just a squabble. It exemplifies, in fact, two different approaches or more accurately, separate philosophical traditions – the “British” (and American I might add) and the “Continental”. In the British tradition of Scottish philosopher David Hume (to which I subscribe), evidence is all, with observational data from experiments that can be repeated and checked. This is what is termed ‘empiricism’ and it holds that all knowledge of fact must be based upon experience: out of the data comes the theory and, when you cannot patch and mend the theory anymore, you ditch it. The philosopher Karl Popper went further and said that for one theory to be better than another it must not just fit the facts but must go on to signal other lines of investigation – as with the postulation of the famed Higg’s boson for example. However, almost the opposite view pertains in the “continental tradition” of G.W.F. Hegel which was initiated by Plato and expanded by Emmanuel Kant. Here, the idea is all – and, of course, the danger is that observation becomes selective (we are human after all) and data gathering is carried out to fit a predetermined concept – there are myriads of examples of such blindness throughout the history of science. *Ophrys* taxonomy is but one!

For example, the ‘proliferation of species’ has led to taxa under the *“fuciflora’* umbrella being recently split along the Apennine chain – something that disturbs a number of us (Italians mainly) who know these taxa well and the sheer impossibility of separating them in the field. I know, from experience, just how selective people can be when they photograph such things and choose those that ‘fit’. The original article from J. Eur. Orch. 43 (4): 759 - 784. 2011 “*New species in Ophrys (Orchidaceae) to the Italian and French Florae”* by Rolando Romolini & Romieg Soca was sent to me by a professional Italian botanist whose despair I shared.

No DNA analysis would sanction this and I would suggest that, realistically, morphological data does not do so, either. Sr Romolini, one of the authors of *Ophrys d’Italia* reveals scant regard for the approach to *Ophrys* classification suggested by DNA analysis and dismisses the authors thus when talking about a study of *O. fuciflora* from Kent :

“ In fact, the BATEMAN team is unaware of the difference between non-reproductive isolation and genetic differentiation and is not familiar with ecological speciation.”

I guess that Sr Romolini is not familiar with the literature on the subject for he would know that the authors possess considerable knowledge of such elementary concepts. They are professional scientists of note whose published work is, properly, ‘peer reviewed’– regrettably, something rare in the European orchid world. Fortunately, Salvatore Cozzolino, who wrote the clear and concise chapter on phylogeny is far more positive. These are quibbles and, of course, irrelevant if you cannot read the French or Italian!

To conclude, this is a superbly illustrated work that is throughly researched with a welter of information difficult to find elsewhere but, on the taxonomy, I feel the jury might still be out. I might be wrong but I believe (hope and pray, in fact) that it is the genetic approach that will, one day, provide a better understanding of the genus *Ophrys* and a simpler taxonomic schema. Who knows and, ultimately, does one care? What I share with contributors Rolando Romolini, Rémy Souche, Lorenzo Dotti *et al*, is a love of these plants and finding them. After all, that is what is important in the end. *Ophrys d’ Italia* costs 65 euros but is, like the superbly illustrated works of Karel Kreutz, a definite classic of the genre!